STIC Search Report
EIC 2800

STIC Database Tracking Number: 113931

TO: Monica Lewis **Location: JEF 5A30** **Art Unit : 2822** **Thursday, February 12, 2004** **Case Serial Number: 09/893477**	**From: Scott Hertzog** **Location: EIC 2800** **JEF4B68** **Phone: 272-2663** **Scott.hertzog@uspto.gov**

Search Notes

Examiner Lewis,

Attached are edited first pass search results from the patent and nonpatent databases.

Colored tags indicate abstracts especially worth your review.

If you need further searching or have questions or comments, please let me know.

Thanks,
Scott Hertzog

STIC Search Results Feedback Form

EIC 2800

Questions about the scope or the results of the search? Contact ***the EIC searcher or contact:***

Jeff Harrison, EIC 2800 Team Leader
571-272-2511, JEF 4B68

Voluntary Results Feedback Form

- *I am an examiner in Workgroup:* ☐ *Example: 2810*
- *Relevant prior art **found**, search results used as follows:*
  - ☐ 102 rejection
  - ☐ 103 rejection
  - ☐ Cited as being of interest.
  - ☐ Helped examiner better understand the invention.
  - ☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature
  (journal articles, conference proceedings, new product announcements etc.)

- *Relevant prior art **not found:***
  - ☐ Results verified the lack of relevant prior art (helped determine patentability).
  - ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

Drop off or send completed forms to STIC/EIC2800, CP4-9C18

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FILE 'HCAPLUS' ENTERED AT 15:33:05 ON 11 FEB 2004
COPYRIGHT (C) 2004 AMERICAN CHEMICAL SOCIETY (ACS)

L2            0 (US5412230 OR US5371387)/RPN

File 342:Derwent Patents Citation Indx  1978-04/200402
       (c) 2004 Thomson Derwent

S1            2   PN=(US 5412230 OR US 5371387)
? map pn t ex
S2            2   PN=CA 2080081 + PN=DE 69208808 + PN=EP 539949 + PN=JP 4162-
              539 + PN=JP 5121453 + PN=US 5371387 + PN=US 5412230
? map cg t ex
S3           48   CG=EP 718890 + CG=US 5449928 + CG=US 5596211 + CG=US 56524-
               40 + CG=US 5801405 + CG=US 6037242 + CG=US 6603784
? map pn t ex
S4           49   S4:S14
? map an t
Serial#TD180

File 350:Derwent WPIX 1963-2004/UD,UM &UP=200410
         (c) 2004  Thomson Derwent

Set     Items   Description
S1        285  Serial: TD180 (citing 1449 refs ~~and selecting those refs~~)
S2     859190   MAX OR MAXIM??????? OR MIN OR MINIM??????? OR PEAK???? OR -
              VALL? OR (V OR U)(2N)(SHAPE??? OR PROFIL???? OR GRAD??????? OR
               DISTRIB?)
S3         25   S1 AND S2
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who cited the same patents as applicant?

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SYSTEM:OS  - DIALOG OneSearch
  File   2:INSPEC  1969-2004/Feb W1
         (c) 2004 Institution of Electrical Engineers
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         (c) 2004 NTIS, Intl Cpyrght All Rights Res
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  File  94:JICST-EPlus  1985-2004/Feb W1
         (c)2004 Japan Science and Tech Corp(JST)
  File  99:Wilson Appl. Sci & Tech Abs  1983-2004/Jan
         (c) 2004 The HW Wilson Co.
  File 103:Energy SciTec  1974-2004/Feb B1
         (c) 2004 Contains copyrighted material
  File 144:Pascal  1973-2004/Feb W1
         (c) 2004 INIST/CNRS
  File 239:Mathsci  1940-2004/Mar
         (c) 2004 American Mathematical Society
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         (c) 1999 Electric Power Research Inst.Inc
  File 305:Analytical Abstracts  1980-2004/Jan W1
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         (c) 2004 DECHEMA
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         (c) 2004 Elsevier Eng. Info. Inc.
  File 987:TULSA (Petroleum Abs)  1965-2004/Feb W3
         (c)2004 The University of Tulsa
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S1      22547   CI=(IN SS(S)P SS(S)SB SS OR AS SS(S)GA SS(S)SB SS OR AS SS-
             (S)GA SS(S)IN SS OR GA SS(S)IN SS(S)SB SS OR AS SS(S)IN SS(S)P
              SS)(S)NE=3
S2     4365202   MAX OR MAXIM??????? OR MIN OR MINIMUM??????? OR PEAK???? OR
              VALL? OR (V OR U)(2N)(SHAPE??? OR PROFIL???? OR GRAD??????? -
             OR DISTRIB?)
S3        5001   S1 AND S2
S4    11611370   COMPOSITION???? OR RATIO? ? OR AMOUNT? ? OR CONCENTRATION?
             ? OR DISTRIBUT?????
S5      335502   S2(5N)S4
S6        6634   S1 AND S4
S7     1178623   CHANNEL? ?
S8       25508   M!FET? ? OR HEMT OR ELECTRON? ?(2N)MOBIL????(2N)TRANSISTOR-
             ????
S9         251   S6 AND S7 AND S8
S10        249   RD (unique items)
S11     458454   DT='PATENT':DT='PATENT APPLICATION'
S12          0   S10 AND S11
S13        213   S10 NOT PY>2000
S14        213   S13 NOT PD>20000719
S15   26087348   VARIE?? OR VARIABL? OR VARY???? OR PROFIL? OR INCREAS???? -
             OR DECREAS???? OR CHANG????? OR LARGE?? OR SMALL??? OR LOW OR
             LOWER? OR LOWEST OR HIGH OR HIGHE??
S16   12019540   PROPORTION?????? OR RELATION? OR WIDE???? OR BROAD OR BROA-
             DE? OR NARROW???? OR TAPER???? OR CONTRACT?? OR CONTRACTING OR
              REDUC????? OR ATTENUAT? OR COMPRESS????
S17    9159879   EXPAN????? OR THIN OR THINNE??? OR THINNING OR THICK??? OR
             FUNCTION???? OR INHOMOGENOUS? OR NONUNIFORM???? OR (UN OR NON-
             )(2N)(UNIFORM????? OR HOMOGEN???????? OR CONSTANT????) OR "NOT
              UNIFORM" OR "NOT HOMOGENOUS" OR "NOT CONSTANT"
S18    3352018   (S15:S17)(5N)S4
S19        102   S18 AND S14
S20     257065   BANDGAP? OR BAND(W)GAP? OR ENERG????(3N)BAND? OR LATTICE(3-
             N)CONSTANT?
S21          6   S19 AND S20
S22         96   S19 NOT S21
S23         96   RD (unique items)
S24    1510061   GRAD???????
S25         13   S24 AND S23
S26         83   S23 NOT S25
```

SEARCH REQUEST FORM **Scientific and Technical Information Center - EIC2800**

Rev. 8/27/01 This is an experimental format -- Please give suggestions or comments to Jeff Harrison, CP4-9C18, 306-5429.

Date 2/9/04 Serial # 09/893,499 Priority Application Date _____

Your Name M. Lewis Examiner # _____

AU 2892 Phone 272-1838 Room 5A30

In what format would you like your results? Paper is the default. (PAPER) DISK EMAIL

If submitting more than one search, please prioritize in order of need.

The EIC searcher normally will contact you before beginning a prior art search. If you would like to sit with a searcher for an interactive search, please notify one of the searchers.

Where have you searched so far on this case?
Circle: USPT DWPI EPO Abs JPO Abs IBM TDB

Other: _____

What relevant art have you found so far? Please attach pertinent citations or Information Disclosure Statements. _____

What types of references would you like? Please checkmark:

Primary Refs ✓ Nonpatent Literature ___ Other _____
Secondary Refs ___ Foreign Patents ___
Teaching Refs ___

What is the topic, such as the **novelty**, motivation, utility, or other specific facets defining the desired **focus** of this search? Please include the concepts, synonyms, keywords, acronyms, registry numbers, definitions, structures, strategies, and anything else that helps to describe the topic. Please attach a copy of the abstract and pertinent claims.

Claims 1, 3-6, 8 & 12

Problem: See pages 1-3
Solution: " " 3-5

Staff Use Only
Searcher: KERRI COX
Searcher Phone: 2-2663
Searcher Location: STIC-EIC2800 ~~CP4-9C18~~ JEF 4868
Date Searcher Picked Up: 2/10/04 am
Date Completed: 2/11/04
Searcher Prep/Rev Time: 360
Online Time: 101

Type of Search
Structure (#) _____
Bibliographic ✓
Litigation _____
Fulltext _____
Patent Family _____
Other _____

Vendors
STN ✓
Dialog ✓
Questel/Orbit _____
Lexis-Nexis _____
WWW/Internet _____
Other _____

25/9/2 (Item 2 from file: 2)
DIALOG(R)File 2:INSPEC

6424641 INSPEC Abstract Number: A2000-02-7340L-003, B2000-01-0520F-077
Title: Improved double delta-doped InGaAs/GaAs heterostructures with symmetric **graded channel**
Author(s): Li, Y.J.; Shieh, H.M.; Su, J.S.; Kao, M.J.; Hsu, W.C.
Journal: Materials Chemistry and Physics vol.61, no.3 p.266-9
Publication Date: 1 Nov. 1999 Country of Publication: Switzerland
CODEN: MCHPDR ISSN: 0254-0584
Abstract: Improved delta-doped (delta -doped) InGaAs/GaAs field-effect transistors by **grading** both sides of the InGaAs **channel** are grown by metal-organic chemical vapor deposition. With the In **composition** linearly **varied** from x=0.18 at the GaAs/InGaAs heterointerface to x=0.25 at center of the InGaAs **channel** , significantly enhanced mobility due to reduced scattering is achieved when compared to that without **graded** heterostructure. A distinguishable two-dimensional electron gas from Shubnikov-de Hass (SdH) measurement is observed. Meanwhile, an improved extrinsic transconductance of 300 mS/mm with gate length of 1.2 mu m is obtained. (10 Refs)
Class Codes: A7340L (Electrical properties of semiconductor-to-semiconductor contacts, p-n junctions, and heterojunctions); A6855 (Thin film growth, structure, and epitaxy); A7360L (Electrical properties of III-V and II-VI semiconductors (thin films/low-dimensional structures)); A8115H (Chemical vapour deposition); B0520F (Chemical vapour deposition); B2520D (II-VI and III-V semiconductors); B2530B (Semiconductor junctions); B2560S (Other field effect devices)
Chemical Indexing:
InGaAs-GaAs int - InGaAs int - GaAs int - As int - Ga int - In int - InGaAs ss - **As ss** - **Ga ss** - **In ss** - GaAs bin - As bin - Ga bin (Elements - **3**,2,**3**)
Numerical Indexing: size 1.2E-06 m; electrical conductivity 3.0E+02 S/m

3/9/14
DIALOG(R)File 350:Derwent WPIX

WPI Acc No: 1993-238099/199330
Electron gas FET has improved indium gallium arsenide channel layer - with reduced lattice mismatch and high electron mobility and confinement
Patent Assignee: NEC CORP (NIDE)
Inventor: ANDO Y; KUZUHARA M; ONDA K
Patent Family:

JP 5160162	A	19930625	JP 91320828	A	19911205	199330	B
US 5373168	A	19941213	US 92988407	A	19921207	199504	

Priority Applications (No Type Date): JP 91320828 A 19911205
Abstract (Basic): US 5373168 A

A cpd. semiconductor multilayer structure having a two-dimensional electron gas (2DEG), comprises first and second potential barriers (14,2), comprising n-doped AlGaAs and intrinsic GaAs resp., a quantum well layer of i-InxGa1xAs of lower band gap than the barrier layers and comprising four layers (13A,B,C) in which x is greater in the second, central layer (13B) than in the layers adjacent to the barriers and the band gap varies perpendicularly with a **min**. between, but not adjacent to, the interfaces.

Also claimed is a structure as above in which x has a **max**. value at 30-110 A from the potential barrier to AlGaAs. Further claimed is a structure as above in which there is a fifth layer in the quantum well layer with x continuing to decrease towards the barrier.

Also claimed is a structure as above in which there is a fifth layer as above and x has a **max**. value at 30-100 A as above. Further claimed is a structure as above in which x has a **max**. value in the fourth layer of five.

Also claimed is an FET as above in which the substrate is semi-insulating, the multilayer is epitaxial, there is a buffer layer, source and drain are formed on the potential barrier layer, and a gate contact.

Further claimed is a structure as above forming an FET in which x has a **max**. value in the third layer of the channel layer rather than the second layer as in the claim above.
Also claimed is an FET as above in which x in the channel layer has a **max**. value at 30-100 A from the potential barrier layer.
Further claimed is an FET as above in which x has a **max**. in the third layer of the channel layer and not the second as above.
Also claimed is an FET as above in which x has a **max**. value in the fourth of the five channel layers.
USE - For quantum well FET devices such as MODFETs, HEMTs, and other 2DEGFETs.
ADVANTAGE - Electron mobility and confinement is good at high electron densities and lattice mismatch is suppressed.
International Patent Class (Main): H01L-021/338; H01L-029/80
International Patent Class (Additional): H01L-029/161; H01L-029/205; H01L-029/227; H01L-029/812

3/9/16
DIALOG(R)File 350:Derwent WPIX

Gallium indium arsenide FET - has planar dope layer and greater saturation velocity and carrier-confined efficiency

Patent Assignee: KUWATA N (KUWA-I); SUMITOMO CHEM CO LTD (SUMO); SUMITOMO ELECTRIC CO (SUME); SUMITOMO ELECTRIC IND CO (SUME)
Inventor: KUWATA N
US 5206527 A 19930427 US 91788149 A 19911107 199318
EP 484968 B1 19950426 EP 91119069 A 19911108 199521
Priority Applications (No Type Date): JP 91976 A 19910109; JP 90305747 A 19901109

Abstract (Basic): EP 484968 A

An FET, having greater saturation velocity and carrier confined and doping efficiency, comprises a channel layer (4,5,6) of GaInAs, having a two-dimensional thin plane doped layer, a cap layer (7) and buffer layer (3) of GaInAs of lower In compsn. than the channel layer and lying above and below it, and two semi-conductor layers (8,2) in contact with the cap and buffer layers and composed of GaAs or GaInAs contg. less In than these layers.

USE/ADVANTAGE - An FET (claimed) useful for high frequency applications is provided. The planar doped layer device has greater saturation velocity, carrier confined efficiency and doping efficiency, and saturation velocity in a weaker electric field is not degraded.

Dwg.8/29

Abstract (Equivalent): US 5206527 A

Field effect transistor (FET) comprises channel layer of FaInAs having planar doped layer formed by impurity doping in a thin plane; cap layer and buffer layer of GaInAs to sandwich and contact the channel layer inbetween, with cap and buffer layers having an In concn. lower than **min**.. In concn. of chamber layer; 1st semiconductor layer underlying the buffer layer and having In concn. lower than **min**.. In concn. of the buffer layer; and 2nd semiconductor layer on the cup layer with In concn. lower than **min**. In concn. of the cup layer.

Pref. plane doped layer is central of the channel layer.

ADVANTAGE - High saturation velocity, carrier confine and doping-efficiency.

International Patent Class (Main): H01L-021/338; H01L-029/784; H01L-029/80; H01L-029/812
International Patent Class (Additional): H01L-029/161; H01L-029/205; H01L-029/36; H01L-029/48; H01L-029/81

fp